

TPD1008SA

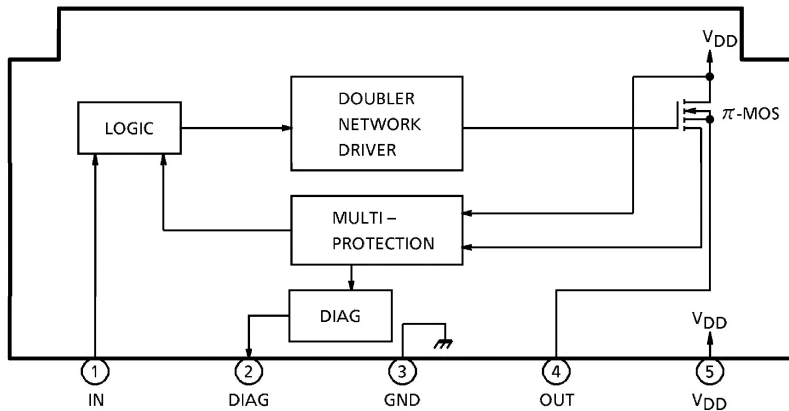
HIGH-SIDE POWER SWITCH for MOTORS, SOLENOIDS, and LAMP DRIVERS

TPD1008SA is a monolithic power IC for high-side switches. The IC has a vertical MOS FET output which can be directly driven from a CMOS or TTL logic circuit (e.g., an MPU). The device offers intelligent self-protection and diagnostic functions.

FEATURES

- A monolithic power IC with a new structure combining a control block (Bi-CMOS) and a vertical power MOS FET (π -MOS) on a single chip.
- One side of load can be grounded to a high-side switch.
- Can directly drive a power load from a microprocessor.
- Built-in protection against overheating and load short circuiting.
- Incorporates a diagnosis function that allows diagnosis output to be read externally at load short circuiting, opening, or overheating.
- Up to $-10V$ of counter electromotive force from an L load can be applied.
- Low on resistance : $R_{DS(ON)} = 200m\Omega$ (Max)
- Low operating current: $I_{DD} = 1mA$ (Typ.)、@ $V_{DD} = 12V$, $V_{IN} = 0$
- 5-pin TO-220 insulated package.
- Three standard lead configurations.

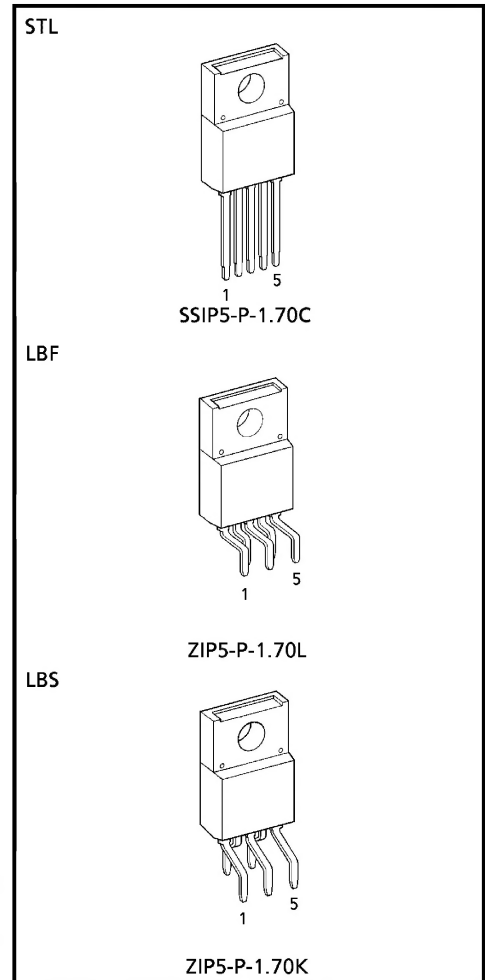
PIN ASSIGNMENT



(Note) That because of its MOS structure, this product is sensitive to static electricity.

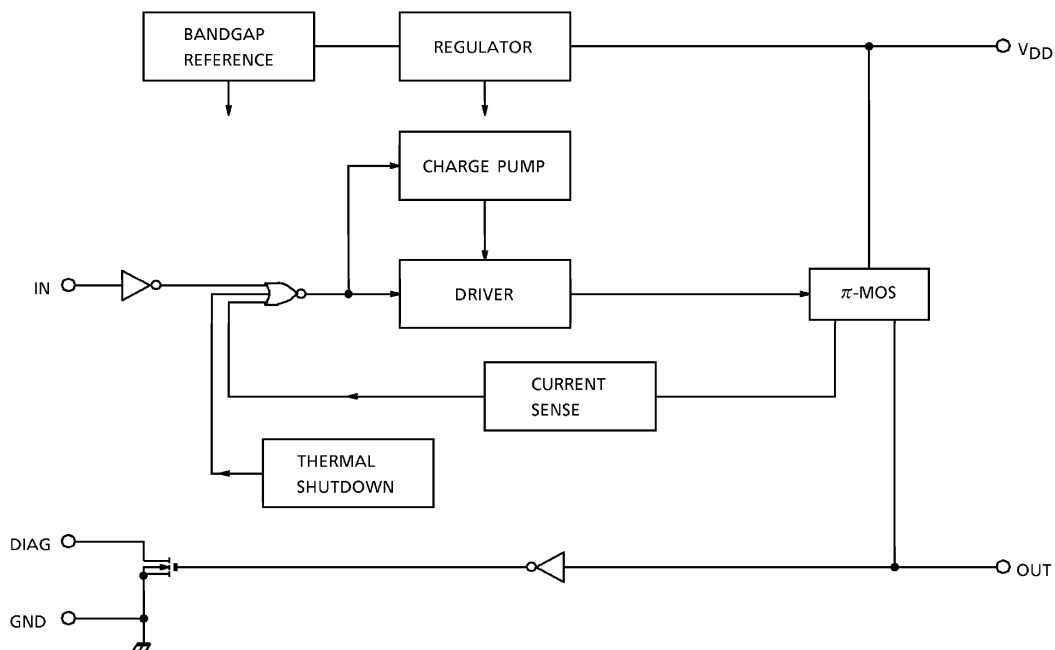
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Weight
 SSIP5-P-1.70C : 2.1g (Typ.)
 ZIP5-P-1.70L : 2.1g (Typ.)
 ZIP5-P-1.70K : 2.1g (Typ.)

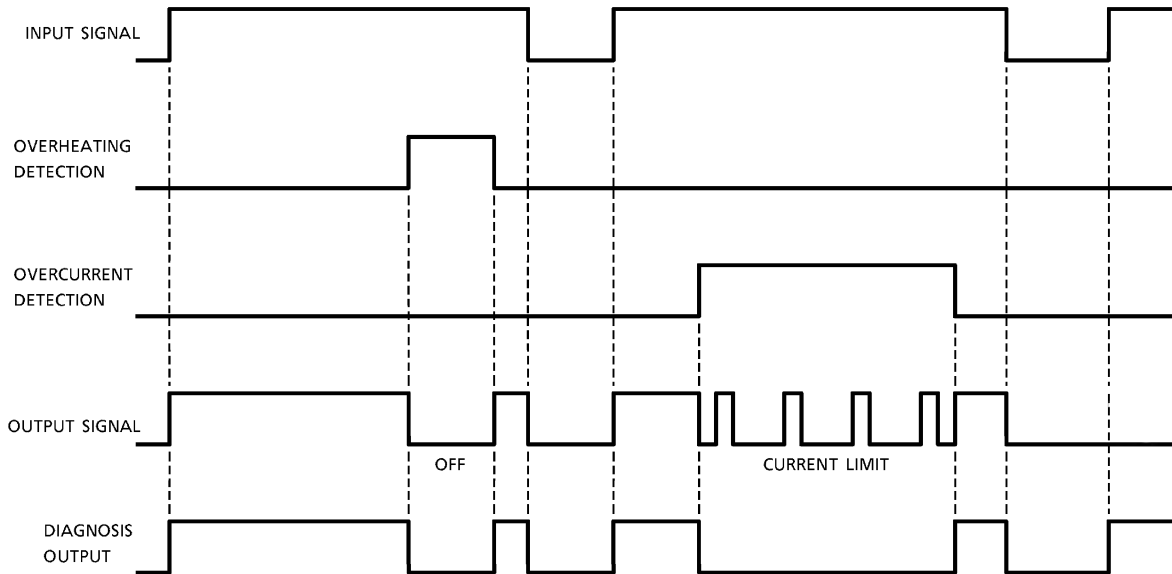
BLOCK DIAGRAM



PIN DESCRIPTION

PIN No.	SYMBOL	FUNCTION
1	IN	Input is CMOS-compatible, with pull-down resistor connected. Even if the input is open, output will not accidentally turn on.
2	DIAG	Self-diagnosis detection pin. Goes low when overheating is detected or when output is short circuited with input on (high). N-channel open drain.
3	GND	Ground pin.
4	OUT	When the load is short circuited and current in excess of the detection current flows to the output pin, the output automatically turns on or off.
5	VDD	Power pin

TIMING CHART



TRUTH TABLE

INPUT SIGNAL	OUTPUT SIGNAL	DIAGNOSIS OUTPUT	STATE
H	H	H	Normal
L	L	L	
H	L	L	Load short circuited
L	L	L	
H	H	H	Load open
L	H	H	
H	L	L	Overheating
L	L	L	

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-source Voltage		V _{DS}	60	V
Supply Voltage	DC	V _{DD} (1)	25	V
	Pulse	V _{DD} (2)	60 (Rs = 1Ω, τ = 250ms)	V
Input Voltage	DC	V _{IN} (1)	- 0.5~12	V
	Pulse	V _{IN} (2)	V _{DD} (1) + 1.5 (t = 100ms)	V
Diagnosis Output Voltage		V _{DIAG}	- 0.5~25	V
Output Current		I _O	Internally Limited	A
Input Current		I _{IN}	± 10	mA
Diagnosis Output Current		I _{DIAG}	5	mA
Power Dissipation	Tc = 25°C	P _D (1)	30	W
	Ta = 25°C	P _D (2)	2	W
Operating Temperature		T _{opr}	- 40~110	°C
Junction Temperature		T _j	150	°C
Storage Temperature		T _{stg}	- 55~150	°C
Lead Temperature/Time		T _{SOL}	275 (5 s), 260 (10 s)	°C

ELECTRICAL CHARACTERISTICS (Tc = - 40~110°C, V_{DD} = 8~18V)

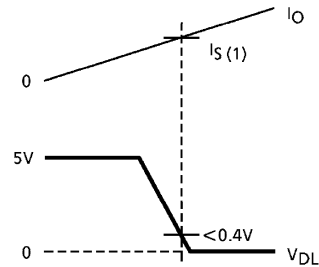
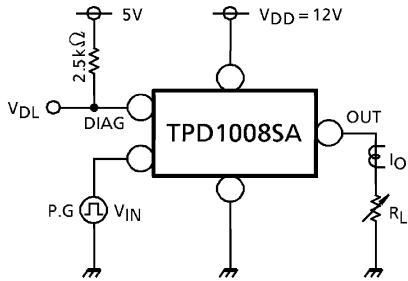
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Operating Supply Voltage		V _{DD} (OPR)	—	—	5	12	18	V
Current Dissipation		I _{DD}	—	V _{DD} = 12V, V _{IN} = 0	—	1	5	mA
Input Voltage		V _{IH}	—	V _{DD} = 12V, I _O = 2A	3.5	—	—	V
		V _{IL}	—	V _{DD} = 12V, I _O = 1.2mA	—	—	1.5	V
Input Current		I _{IN} (1)	—	V _{DD} = 12V, V _{IN} = 5V	—	50	200	μA
		I _{IN} (2)	—	V _{DD} = 12V, V _{IN} = 0	- 0.2	—	0.2	μA
On Voltage		V _{DS} (ON)	—	V _{DD} = 12V, I _O = 2A, Tc = 25°C	—	—	0.4	V
On Resistance		R _{DS} (ON)	—	V _{DD} = 12V, I _O = 2A, Tc = 25°C	—	—	0.2	Ω
Output Leakage Current		I _{OL}	—	V _{DD} = 18V, V _{IN} = 0	—	—	1.2	mA
Diagnosis Output Voltage	L Level	V _{DL}	—	V _{DD} = 12V, I _{DL} = 2mA	—	—	0.4	V
Diagnosis Output Current	H Level	I _{DH}	—	V _{DD} = 18V, V _{DH} = 18V	—	—	10	μA
Overcurrent Detection		I _S (1) (Note 1)	1	V _{DD} = 12V, Tc = 25°C	4	6	8	A
		I _S (2) (Note 2)	2		4	8	12	A
Overheating Detection	Temperature	T _S	—	—	150	160	200	°C
	Hysteresis	ΔT _S	—	—	—	10	—	°C
Open Detection Resistance		R _{Ops}	—	V _{DD} = 8V	1	20	100	kΩ
Switching Time		t _{ON}	3	V _{DD} = 12V, R _L = 5Ω Tc = 25°C	10	100	—	μs
		t _{OFF}			10	30	—	μs

(Note 1) Overcurrent detection value when load is short circuited and V_{IN} = L→H.

(Note 2) Overcurrent detection value when load current is increased while V_{IN} = H.

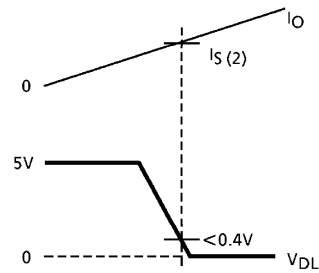
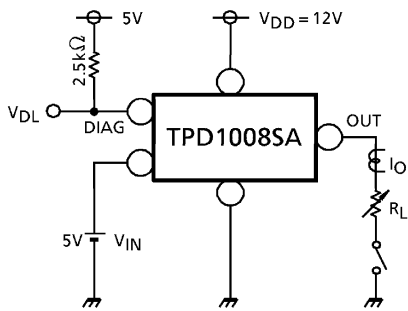
TEST CIRCUIT 1

Overcurrent Detection



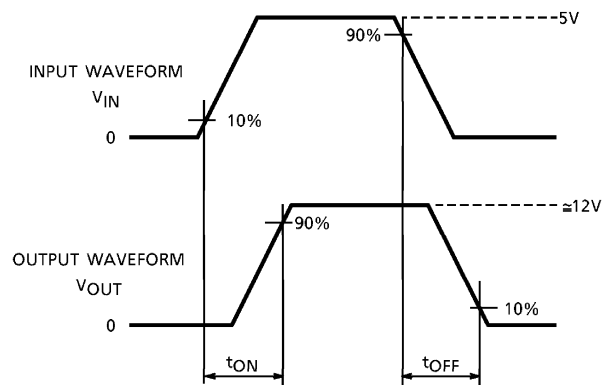
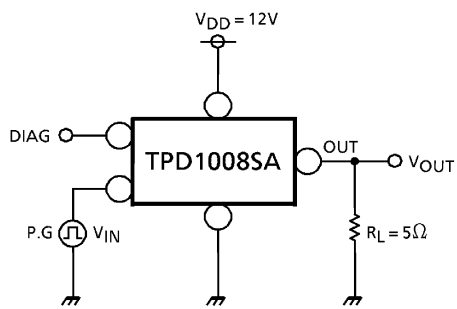
TEST CIRCUIT 2

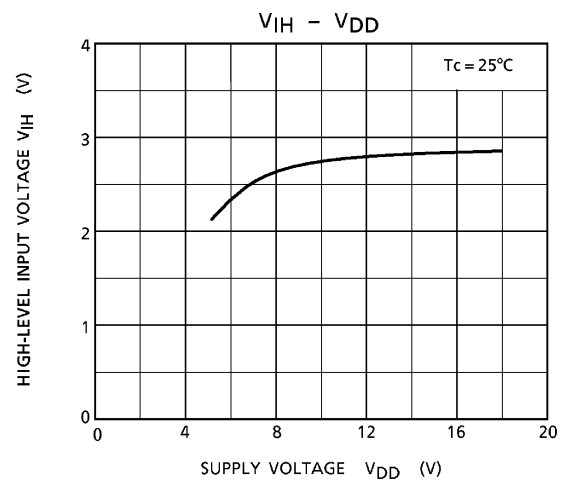
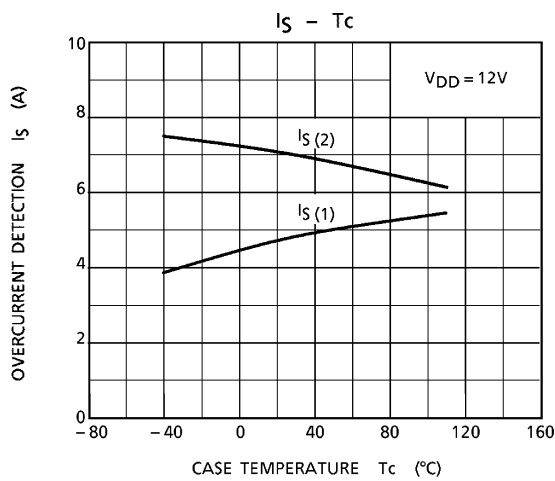
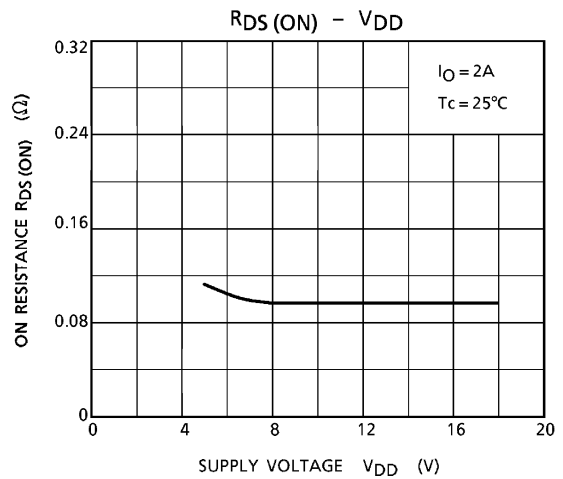
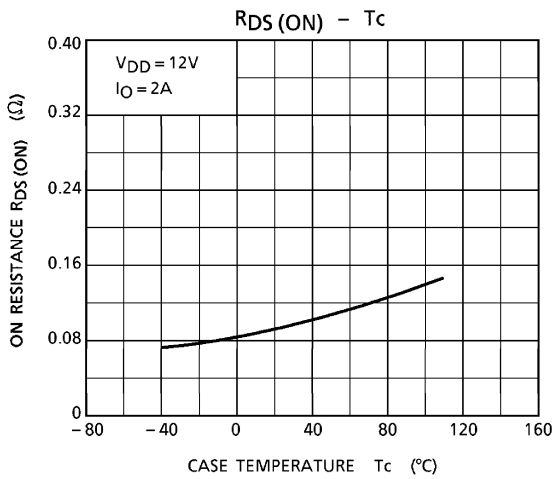
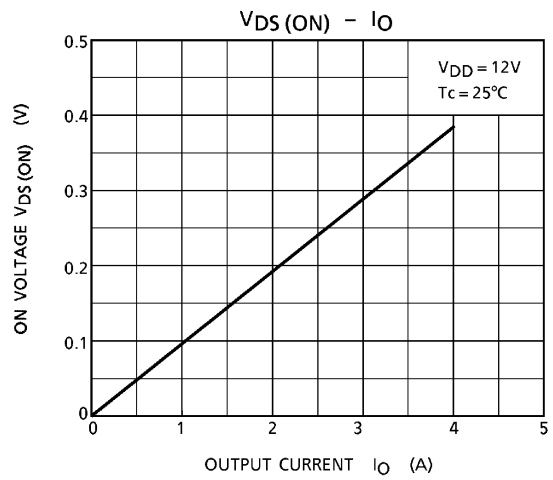
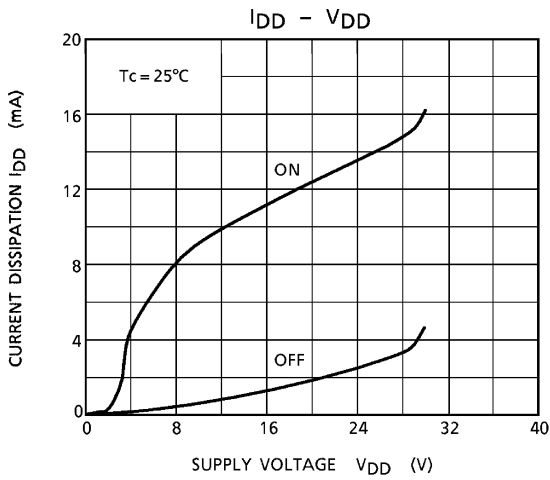
Overcurrent Detection

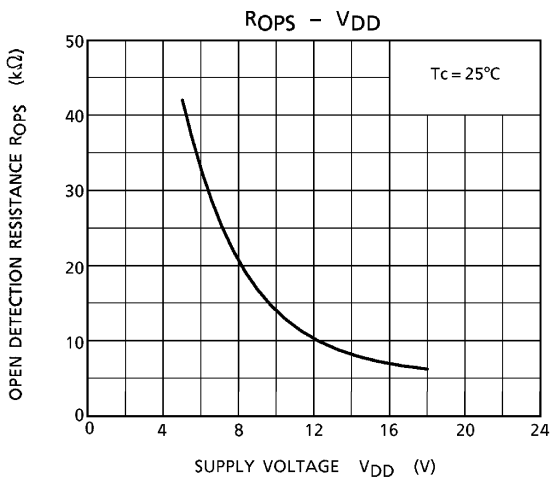
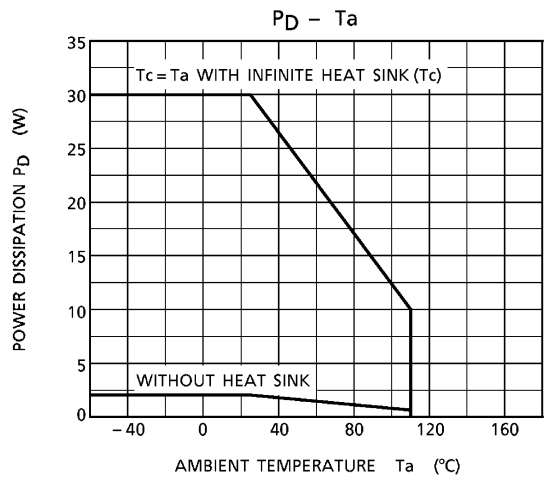
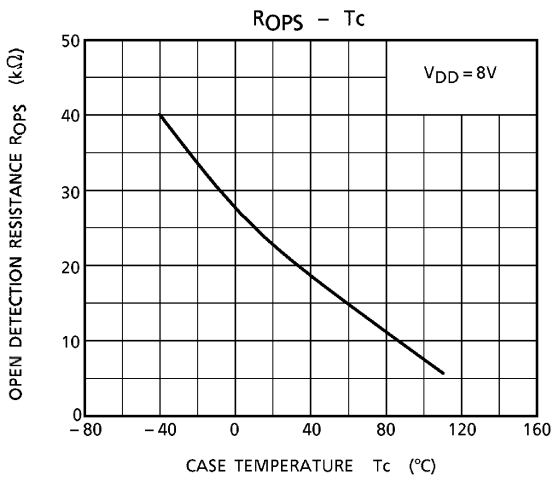
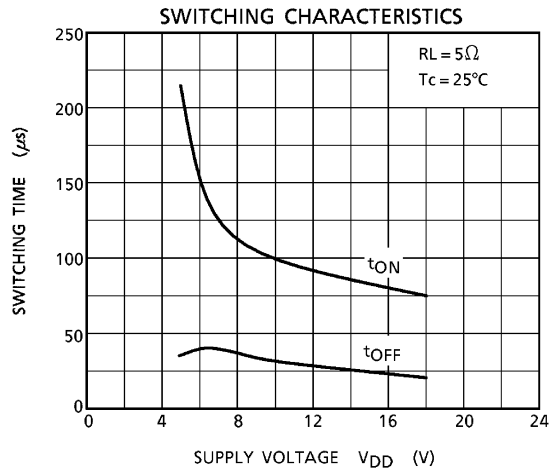
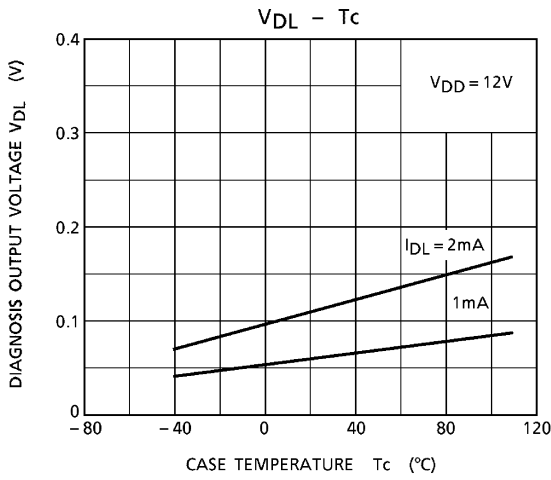


TEST CIRCUIT 3

Switching Time





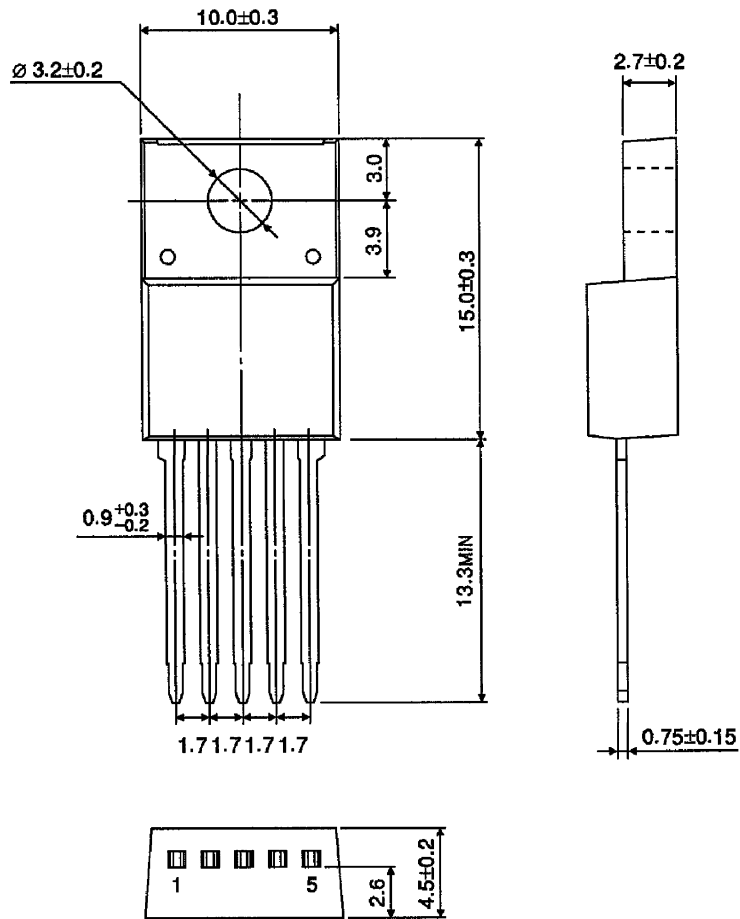


PRECAUTION

1. Since protection for, for example, reverse connection of the battery is not provided, provide protection using external circuits.

OUTLINE DRAWING
SSIP5-P-1.70C (STL)

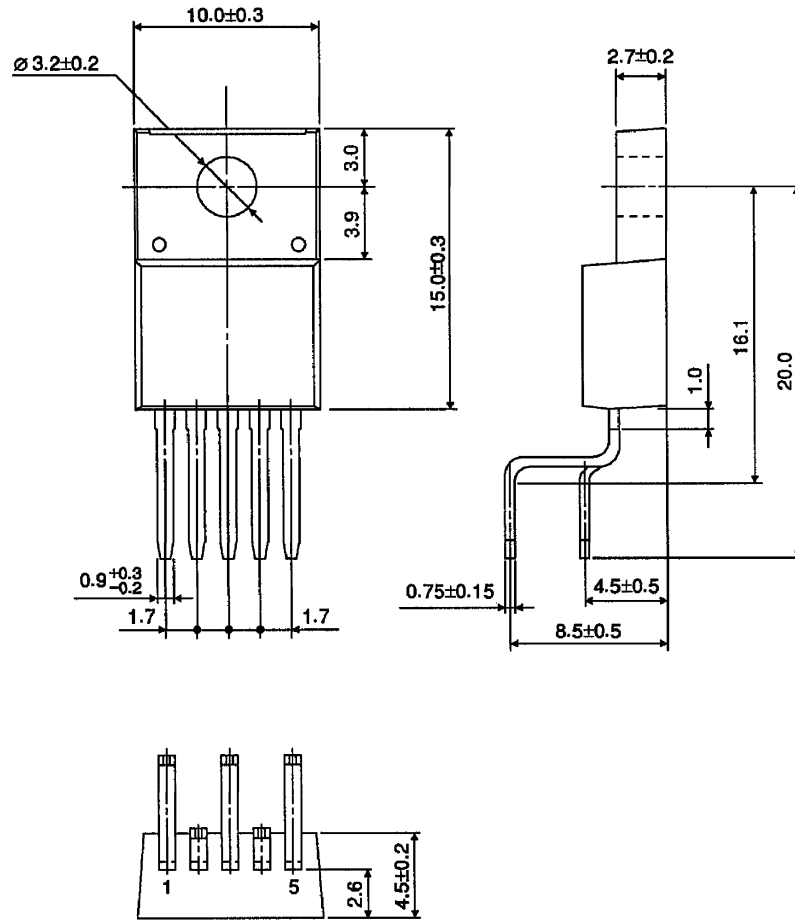
Unit : mm



Weight : 2.1g (Typ.)

OUTLINE DRAWING
ZIP5-P-1.70L (LBF)

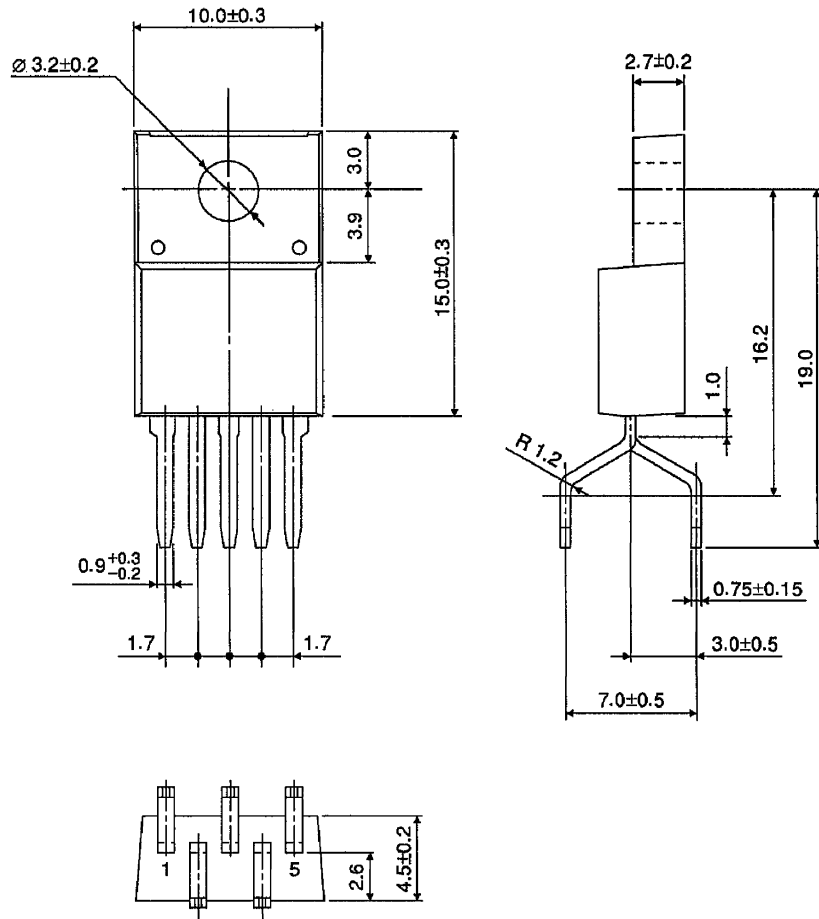
Unit : mm



Weight : 2.1g (Typ.)

OUTLINE DRAWING
ZIP5-P-1.70K (LBS)

Unit : mm



Weight : 2.1g (Typ.)